

FIG. 1

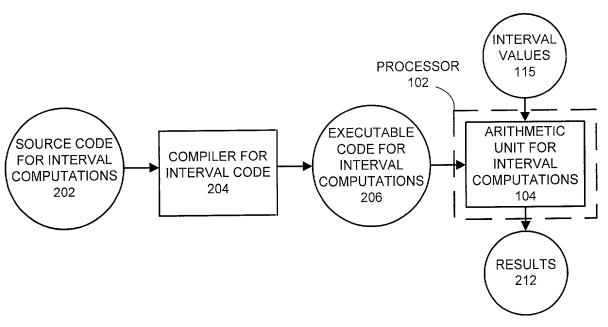


FIG. 2

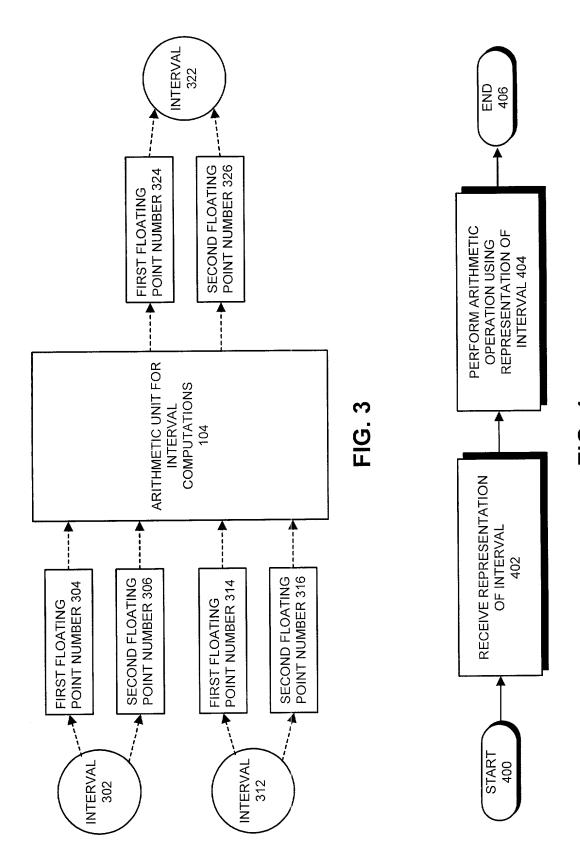


FIG. 4

$$X = \left[ \underline{x}, \overline{x} \right] = \left\{ x \in \Re^* | \underline{x} \le x \le \overline{x} \right\}$$

$$Y = \left[ \underline{y}, \overline{y} \right] = \left\{ y \in \Re^* \middle| \underline{y} \le y \le \overline{y} \right\}$$

(1) 
$$X+Y = \left[\sqrt{\underline{x}} + \underline{y}, \uparrow \overline{x} + \overline{y}\right]$$

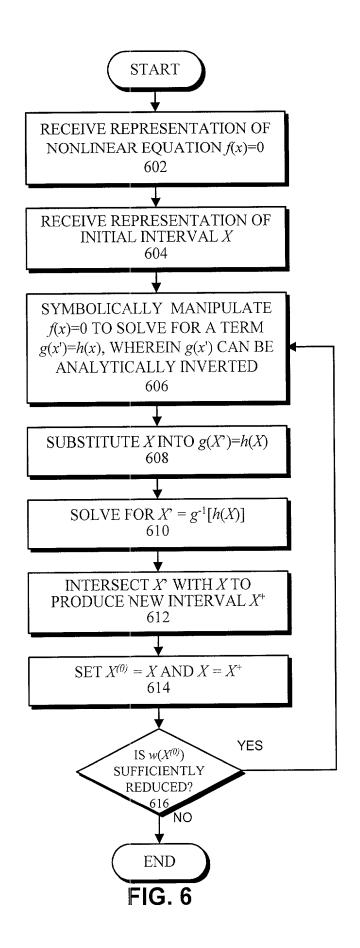
(2) 
$$X-Y = \left[\sqrt{x} - \overline{y}, \uparrow \overline{x} - \underline{y}\right]$$

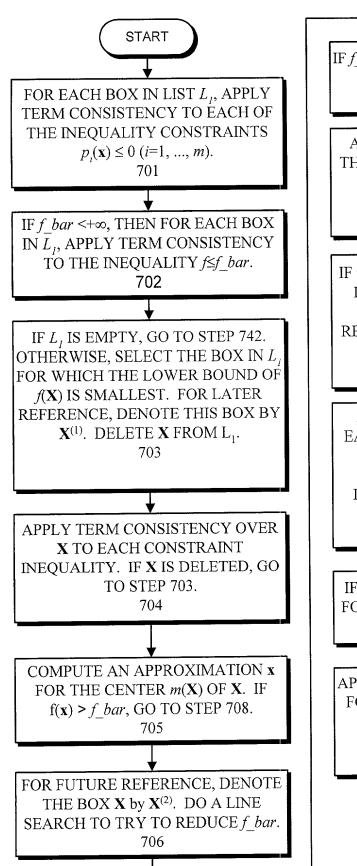
(3) 
$$X \times Y = \left[ \min \left( \sqrt{\underline{x}} \times \underline{y}, \underline{x} \times \underline{y}, \overline{x} \times \underline{y}, \overline{x} \times \underline{y} \right), \max \left( \sqrt{\underline{x}} \times \underline{y}, \underline{x} \times \underline{y}, \overline{x} \times \underline{y}, \overline{x} \times \underline{y}, \overline{x} \times \underline{y} \right) \right]$$

(4) 
$$X/Y = \left[\min\left(\sqrt{x}/\underline{y}, \overline{x}/\underline{y}, \overline{x}/\underline{y}, \overline{x}/\overline{y}\right), \max\left(\sqrt{x}/\underline{y}, \overline{x}/\underline{y}, \overline{x}/\underline{y}, \overline{x}/\underline{y}\right)\right], \quad 0 \notin Y$$

$$X/Y \subseteq \Re^*$$
,  $0 \in Y$ 

## FIG. 5





IF f bar WAS NOT REDUCED IN STEP 706, GO TO STEP 709. 707 APPLY TERM CONSISTENCY TO THE INEQUALITY  $f(\mathbf{x}) \le f$  bar OVER THE CURRENT BOX X. IF X IS DELETED, GO TO STEP 703. 708  $\text{IF } w(\mathbf{X}) \leq \varepsilon_{_{X}} \text{AND } w[f(\mathbf{X})] \leq \varepsilon_{_{F}}, \text{PUT } \mathbf{X}$ IN LIST  $\hat{L}_2$ . OTHERWISE, IF X IS SUFFICIENTLY REDUCED RELATIVE TO THE BOX  $\mathbf{X}^{(1)}$ , PUT  $\mathbf{X}$ IN L, AND GO TO STEP 703. 709 APPLY BOX CONSISTENCY TO EACH INEQUALITY CONSTRAINT. IF f bar  $< +\infty$ , APPLY BOX CONSISTENCY TO THE INEQUALITY  $f(\mathbf{x}) \le f$  bar. IF X IS DELETED, GO TO STEP 703. 710 IF THE UPPER BOUND OF  $p_t(\mathbf{X}) \ge 0$ FOR ANY i=1, ..., n, GO TO STEP 726. 711 APPLY TERM CONSISTENCY TO g=0FOR i=1, ..., n. IF THE RESULT FOR ANY i=1, ..., n IS EMPTY, GO TO STEP 703. 712

FIG. 7A

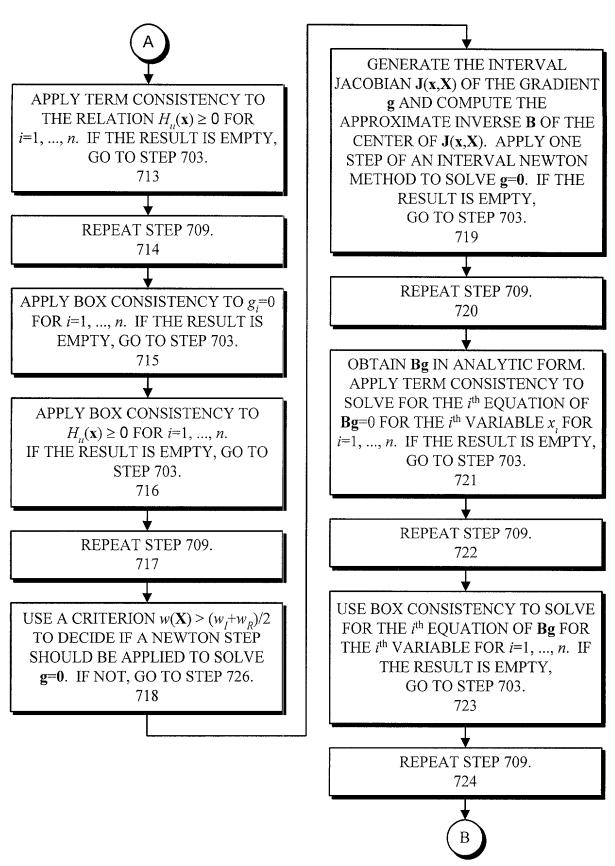


FIG. 7B



USE THE MATRIX B IN A LINE SEARCH TO TRY TO REDUCE *f\_bar*.

COMPUTE AN APPROXIMATION **x** FOR THE CENTER  $m(\mathbf{X})$  OF **X**. IF  $f(\mathbf{x}) > f\_bar$ , GO TO STEP 703.

SKIP THIS STEP AND GO TO STEP 732 IF **X=X**<sup>(2)</sup> IS THE SAME BOX FOR WHICH A LINE SEARCH WAS DONE IN STEP 706. OTHERWISE, DO A LINE SEARCH TO TRY TO REDUCE f\_bar. IF f\_bar IS NOT REDUCED, GO TO STEP 732.

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FOR FUTURE REFERENCE  $\mathbf{X}^{(3)} = \mathbf{X}$ . USE A LINEARIZATION TEST TO DECIDE WHETHER TO LINEARIZE AND "SOLVE" THE INEQUALITY  $f(\mathbf{x}) \leq f_b ar$ . IF THE CRITERION IS NOT SATISFIED, GO TO STEP 732. 728

USE A LINEAR METHOD TO TRY TO REDUCE **X** USING THE INEQUALITY  $f(\mathbf{x}) \le f_b ar$ . IF **X** IS DELETED, GO TO STEP 703. OTHERWISE, IF THIS APPLICATION OF THE LINEAR METHOD DOES NOT SUFFICIENTLY REDUCE BOX **X**<sup>(3)</sup>
GO TO STEP 731.

USE A QUADRATIC METHOD TO TRY TO REDUCE **X** USING THE INEQUALITY  $f(\mathbf{x}) \le f_bar$ . IF **X** IS DELETED, GO TO STEP 703.

REPEAT STEP 709.

USE A LINEARIZATION TEST TO
DECIDE WHETHER TO LINERAIZE
AND "SOLVE" THE INEQUALITY
CONSTRAINTS. IF THE PROCEDURE
INDICATES THAT THE
LINEARIZATION
SHOULD NOT BE DONE,
GO TO STEP 739.
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SELECT THE INEQUALITY
CONSTRAINT TO BE SOLVED IN
LINEARIZED FORM, AND POSSIBLY
ADD TO THIS SET THE INEQUALITY  $f(\mathbf{x}) \leq f_b ar$ . IF NO INEQUALITIES ARE
SELECTED, GO TO STEP 739.
OTHERWISE, LINEARIZE THE
RESULTING SET OF INEQUALITIES,
AND SOLVE THE RESULTING SET
OF LINEAR INEQUALITIES. IF THE
SOLUTION SET IS EMPTY, GO TO
STEP 703.

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REPEAT STEP 709.

FIG. 7C

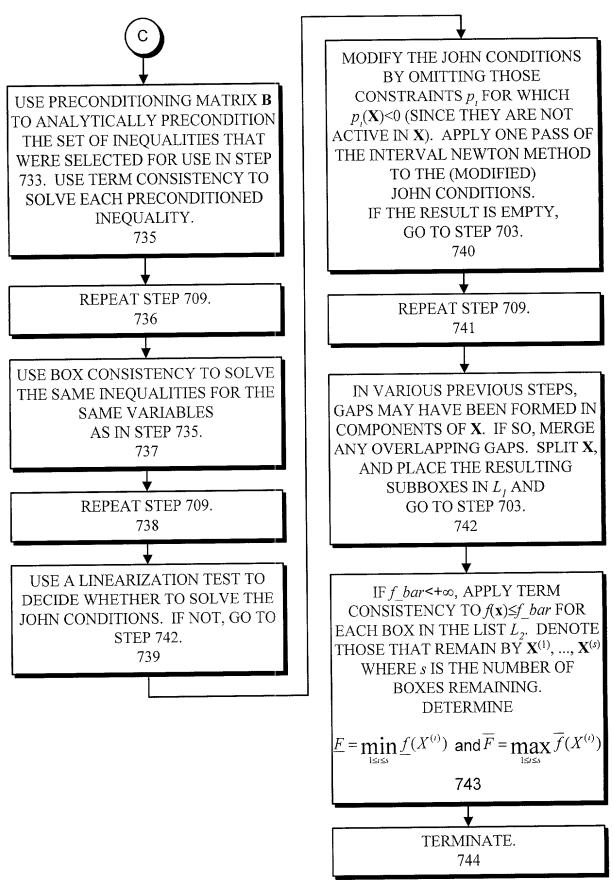


FIG. 7D